



CLINICAL EFFICACY OF SONIC FILL COMPOSITE VERSUS CONVENTIONAL COMPOSITES IN CLASS II CAVITIES IN PRIMARY MOLARS

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ABSTRACT

Conventional caries lesions management is usually based on operative procedures to re-establish the surface integrity and enable efficient dental plaque removal. The aim of the present study was to evaluate the clinical efficacy of sonic fill composite versus conventional composites in restoration class II cavities in primary molars. Twenty four patients having primary teeth indicated for restoration. Group I: Control group (12 patients) those were received conventional composite restorations for class II cavity. Group II: (12 patients) were received composite restoration (sonic fill) for class II cavity. The patients were evaluated according to FDI clinical criteria. The result revealed that the current study show better surface gloss and lower marginal staining found in sonic fill composite than conventional composite with subsequent advent of bulk fill composites, would seem to be a significant turning point in posterior direct restorative dentistry.

INTRODUCTION

Dental caries is a disease with identified etiology and able to be prevented and controlled⁽¹⁾. Conventional caries lesions management is usually based on operative procedures to re-establish the surface integrity and enable efficient dental plaque removal⁽²⁾. Resin composites, introduced in the 1960s⁽³⁾, satisfied aesthetic needs, and nowadays they represent a class of materials widely used in restorative dentistry. Resin composites should fulfil a lot of basic requirements: good optical characteristics; the physical properties should correspond to those of dental hard tissue in terms of wear resistance; they should be distinguishable from dental tissue on x-ray; easy to handle and polish; they should be tasteless and biocompatible and should form a sufficient bond with dental tissue or at least with the dental adhesive. However, many clinical and material limitations have restricted the universal use of resin composites as posterior restorative material⁽⁴⁾.

A novel resin composite system, SonicFil System^{****} was recently introduced in the market. Is indicated for use as a bulk fill posterior composite restorations and can be bulk filled in layers up to 5 mm in depth due to reduced polymerization shrinkage. SonicFill incorporates a highly-filled proprietary resin with special modifiers that react to sonic energy. As sonic energy is applied through the hand piece, the modifier causes the viscosity to drop (up to 87%), increasing the flow ability of the composite enabling quick placement and precise adaptation to the cavity walls. When the sonic energy is stopped, the composite returns to a more viscous, non-slumping state that is perfect for carving and contouring^(5,6).

Rodriguez et al. (2017)⁽⁷⁾ investigated the effect of different light exposure times, shades, and thicknesses on the depth of cure (DOC) of bulk fill composites. A higher bottom/top ratio was achieved when a 40-second cure was compared to a

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20-second cure, when light shades were compared to dark shades, and when 2-mm increments were compared to 4-mm increments. Moharam et al. (2017)⁽⁸⁾ evaluated the Vickers surface micro-hardness and the depth of cure of two bulk-fill resin composites and one incremental-fill resin composite. They showed highest Vickers surface micro-hardness values on both top and bottom surfaces, whether inserted in increments or bulk. Both bulk-fill resin composites showed higher depth of cure for both insertion techniques.

A new clinical criteria were approved by the FDI World Dental Federation since 2007, this criteria were categorized into three groups: esthetic parameters (four criteria), functional parameters (six criteria) and biological parameters (six criteria). Each criterion can be expressed with five scores, three for acceptable and two for non-acceptable (one for reparable and one for replacement). The criteria have been used since 2007⁽⁹⁾. In view of this, this study was aimed to evaluate sonic fill composite according to this criteria.

SUBJECTS AND METHODS

Twenty four patients having primary teeth indicated for restoration. Patients were selected from outpatient clinic of the Department of Pedodontics and Oral Health, Faculty of Dental Medicine, Boys, Cairo, Al-Azhar University. Patients were randomly assigned to two groups: Group I: Control group (12 patients) those were received conventional composite restorations for class II cavity. Group II: (12 patients) were received composite restoration (sonic fill) for class II cavity (Figure 1). Patients were evaluated clinically: Patients were evaluated according to FDI clinical criteria for evaluation of direct and indirect restoration: The criteria are categorized into three groups: esthetic parameters (four criteria), functional parameters (six criteria), and biological parameters (six criteria). Each criterion can be expressed with five scores, three for acceptable and two for non-acceptable (one for reparable and one for replacement). Follow up period is three, six and twelve month's intervals.

RESULTS

In this study, 24 subjects, divided into two groups (12 for each group). The number of females were 10 and males were 14. In group (1), the distribution was 8 males and 4 females while group (2) was 6 female and 6 males.

Comparison between the two treated groups according to clinical parameters (Table 1), and (Figure 2).

Surface gloss

At 3 months; there was no statistically significant difference between Surface gloss measurements in the two groups. After 6 months and 1 year, Sonic Fill Composite group showed statistically significantly lower mean Surface gloss score than Conventional Composite group.

Marginal staining

At 3 months; there was no statistical significant difference between marginal staining measurements in the two groups. After 6 months and 1 year, Sonic Fill Composite group showed statistically significantly lower mean Marginal Staining score than Conventional Composite group.

Proximal contact point and food impaction. At 3 months, 6 months and 1 year; there was no statistical significant difference between proximal contact point and food impaction measurements in the two groups.

Radiographic examination

At 3 months; there was no statistical significant difference between radiographic examination measurements in the two groups. After 6 months and 1 year, Sonic Fill Composite group showed statistically significantly lower mean pathological changes at restoration and tooth margin than conventional composite group.

Effects of the restoration on the periodontium

At 3 months, 6 months and 1 year; there was no statistical significant difference between the effects of the restoration on the periodontium measurements in the two groups.

TABLE (1): Comparison between the two studied groups according to different parameters

		Conventional Composite (n = 12)	Sonic Fill Composite (n = 12)	U	p
Surface gloss	3 Month				
	Min. – Max.	1.0 – 1.0	1.0 – 1.0	72.0	1.000
	Mean ± SD.	1.0 ± 0.0	1.0 ± 0.0		
	Median	1.0	1.0		
	6 Months				
	Min. – Max.	1.0 – 2.0	1.0 – 1.0	42.0*	0.014*
	Mean ± SD.	1.42 ± 0.51	1.0 ± 0.0		
	Median	1.0	1.0		
	1 Year				
	Min. – Max.	1.0 – 3.0	1.0 – 2.0	34.0*	0.012*
	Mean ± SD.	1.83 ± 0.72	1.17 ± 0.39		
	Median	2.0	1.0		
Marginal Staining	3 Month				
	Min. – Max.	1.0 – 1.0	1.0 – 1.0	72.0	1.000
	Mean ± SD.	1.0 ± 0.0	1.0 ± 0.0		
	Median	1.0	1.0		
	6 Months				
	Min. – Max.	1.0 – 2.0	1.0 – 1.0	48.0*	0.032*
	Mean ± SD.	1.33 ± 0.49	1.0 ± 0.0		
	Median	1.0	1.0		
	1 Year				
	Min. – Max.	1.0 – 3.0	1.0 – 2.0	48.0*	0.045*
	Mean ± SD.	1.92 ± 0.67	1.47 ± 0.49		
	Median	2.0	2.0		
Proximal contact point and food impaction	3 Month				
	Min. – Max.	1.0 – 1.0	1.0 – 1.0	72.0	1.000
	Mean ± SD.	1.0 ± 0.0	1.0 ± 0.0		
	Median	1.0	1.0		
	6 Months				
	Min. – Max.	1.0 2.0	1.0 – 2.0	60.0	0.284
	Mean ± SD.	1.25 ± 0.45	1.08 ± 0.29		
	Median	1.0	1.0		
	1 Year				
	Min. – Max.	1.0 – 3.0	1.0 – 2.0	45.0	0.061
	Mean ± SD.	1.75 ± 0.87	1.17 ± 0.39		
	Median	1.50	1.0		

Radiographic examination	3 Month				
	Min. – Max.	1.0 – 1.0	1.0 – 1.0	72.0	1.000
	Mean ± SD.	1.0 ± 0.0	1.0 ± 0.0		
	Median	1.0	1.0		
	6 Months				
	Min. – Max.	1.0 – 2.0	1.0 – 2.0	48.0*	0.015*
	Mean ± SD.	1.58 ± 0.51	1.15 ± 0.45		
	Median	2.0	1.0		
	1 Year				
	Min. – Max.	1.0 – 3.0	1.0 – 2.0	46.0*	0.025*
	Mean ± SD.	2.08 ± 0.79	1.38 ± 0.51		
	Median	2.0	2.0		
Effect of the restoration on the periodontium	3 Month				
	Min. – Max.	1.0 – 1.0	1.0 – 1.0	72.0	1.000
	Mean ± SD.	1.0 ± 0.0	1.0 ± 0.0		
	Median	1.0	1.0		
	6 Months				
	Min. – Max.	1.0 – 2.0	1.0 – 2.0	60.0	0.418
	Mean ± SD.	1.50 ± 0.52	1.33 ± 0.49		
	Median	1.50	1.0		
	1 Year				
	Min. – Max.	1.0 – 3.0	1.0 – 2.0	45.0	0.094
	Mean ± SD.	2.08 ± 0.90	1.50 ± 0.52		
	Median	2.0	1.50		

U, p: U and p values for Mann Whitney test for comparing between the two groups

**: Statistically significant at $p \leq 0.05$*

DISCUSSION

Worldwide; dental caries is a public health problem that affects preschool and high-school children, leading to pain, chewing difficulties, speech problems, general health disorders, psychological problems, and lower quality of life. Although advanced preventive procedures significantly decrease the prevalence of caries in the population, fissure caries on occlusal surfaces and buccal/lingual surfaces is still a considerable problem. Amalgam was for years the most often used restorative material by dentists. Due to aesthetic reasons, environmental and questionable biocompatibility of alloys that

contain mercury, practitioners needed to seek a new material that would satisfy these needs. Resin composites were introduced in the 1960s^(1,2), satisfied aesthetic needs, and nowadays they represent a class of materials widely used in restorative dentistry.

In this study sonic fill composite compared to conventional composite according to FDI clinical criteria for evaluation of direct and indirect restoration including esthetic parameters, functional parameters, and biological parameters), and each criterion can be expressed with five scores, in the present study there was no statistically significant difference between surface gloss measurements in



Fig. (1): Shows Class II cavity preparation (A). Postoperative with Sonic fill composite (B).radiographic examination for sonic fill composite in lower second primary molar (C) after 3 months (D) after 6 months (E) after 1 year.

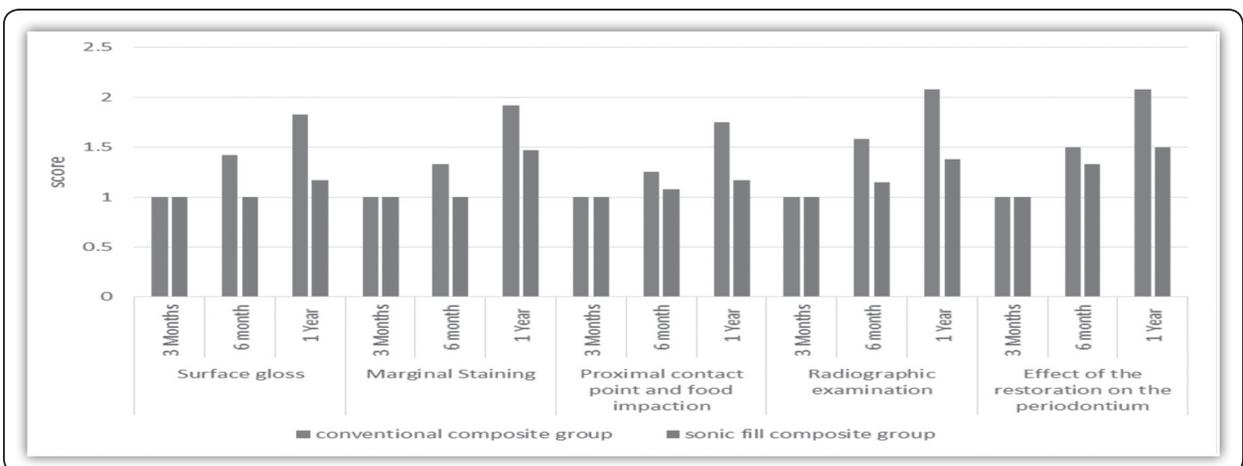


Fig. (2): Bar chart representing comparison between mean different parameters in the two groups

the two groups after 3 months but after 6 months and 1 year, Sonic Fill composite group showed statistically significantly lower mean surface gloss score than conventional composite group. Similar few studies attempted to evaluate the surface gloss of bulk-fill composite resins. However, Van Dijken and Pallesen⁽¹⁰⁾ compared conventional (Ceram-X mono +) and flowable bulk-fill RCs (SDR) in Class I and II, and reported no significant differences between the materials in terms of the criteria assessed (retention, marginal staining, recurrent caries, marginal adaptation, gingival recession, color change, and wear) up to 3 years postrestoration. Similar findings were also reported in another randomized controlled prospective clinical trial⁽¹¹⁾ that evaluated the efficacy of a flowable RC (SDR) bulk-fill technique in posterior restorations and compared the results intra individually with a conventional 2 mm RC curing technique after a 3-year follow-up period.

For marginal staining at 3 months; there was no statistically significant difference the two groups. After 6 months and 1 year, Sonic Fill composite group showed statistically significantly lower mean marginal staining score than conventional composite group, and this also come in accordance with Van Dijken and Pallesen study (2015)⁽¹⁰⁾. This interpreted as the color stability of posterior composite restorations might be affected by the type of tooth, the restoration polishability and heavier occlusal forces. The direct filling technique used by the sonic fill composite facilitate placement of the filling material, and subsequently allow easy finishing compared to the conventional composite with regard to reducing excess material and reducing finishing/adjustment effort and time.

In addition nanohybrid, SonicFill™, has an average particle size ranging from 0.03 to 3 µm. These characteristics may directly related to the surface area that is taken up by filler particles versus resin matrix, as the surface smoothness is generally determined by the largest inorganic particles present-

ed within the composite⁽¹²⁾. In this study proximal contact compared between the two groups at 3 months, 6 months and 1 year; there was no statistically significant difference between proximal contact point and food impaction measurements in the two groups, this come in agreement with study of Andrade⁽¹²⁾. Who compared similar variables and parameters and this is refer to using of appropriate isolation and matricing, and also refer to good finishing for the proximal surface.

Radiographic examination was also compared between the two groups in this study and the results was : At 3 months; was no statistically significant difference between the two groups. After 6 months and 1 year Sonic Fill Composite group showed statistically significantly lower mean pathological changes at restoration and tooth margin than conventional composite group. the last variables was the effects of the restoration on the periodontium and the result at 3 months, 6 months and 1 year; was non significant the two groups. In agreement with this two variables few studies⁽¹³⁻¹⁸⁾ found reported on the clinical success of resin composites in primary teeth, and in the majority of these studies, the restorations were assessed. Only two studies used the FDI criteria^(13, 19).

This finding is in line with those studies that report pathologic failure rates of resin composites which steadily declining, due to advances in sonic fill material, in addition to bonding techniques, and operator experience. In the present study, there is the possibility that the adhesive system employed contributed to the effective performance of the restorations tested. A bulk-fill contains in its composition an inhibitor of sensitivity to light and thus provides prolonged time for modeling of filling, an inhibitor of shrinkage stress to achieve optimal marginal seal and polymerization photoinitiator allowing curing of 4 mm layers of material which insure curing of all composite material with no residual non-cured monomer material.

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